Intercomparison of Mobility Particle Size Spectrometers

Project No.:	*MPSS-2018-6-8*
Principal Investigator:	*Andreas Nowak*
Home Institution:	*PTB*
Participant:	-
Candidate:	**PTB - Braunschweig**
Made by:	**TROPOS**
Counter (SN):	**TSI CPC 3750; SN: 3750181901**
Software:	**TROPOS Software V6.68**
Location of the quality assurance:	TROPOS Leipzig, lab 118
Comparison period:	September 17, 2018 – September 19, 2018
Last Intercomparison (with Project No.):	

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Summary of Intercomparison:

Status:
The performance of the system showed a concentration of 2% below the TROPOS Reference Instrument No.1. The PSL check showed a peak at 203.37 nm. The candidate passed the quality standards of ACTRIS and GAW.

Information about the instruments:

Date of check: September 17, 2018

List of Components		TROPOS Reference MPSS No.1	Candidate
Position		Line 1.2	Line 1.3
Company		TROPOS	TROPOS
Software		TROPOS V6.68	TROPOS V6.68
CPC-MPSS		TSI CPC, Model 3772	TSI CPC, Model 3750
CPC-total		TSI CPC, Model 3010	-
flow ratio		1.0 : 5.0	1.0 : 5.0
source		Kr.85	Kr.85
HV power supply		Positive	Positive
DMA		Hauke medium	Hauke medium
aerosol dryer		✓	✓
aerosol RH- sensor		✓	✓
aerosol T-sensor		✓	✓
sheath RH-sensor		✓	✓
sheath T-sensor		✓	✓
Sheath dryer		✓	✓
pressure sensor		✓	✓
info			

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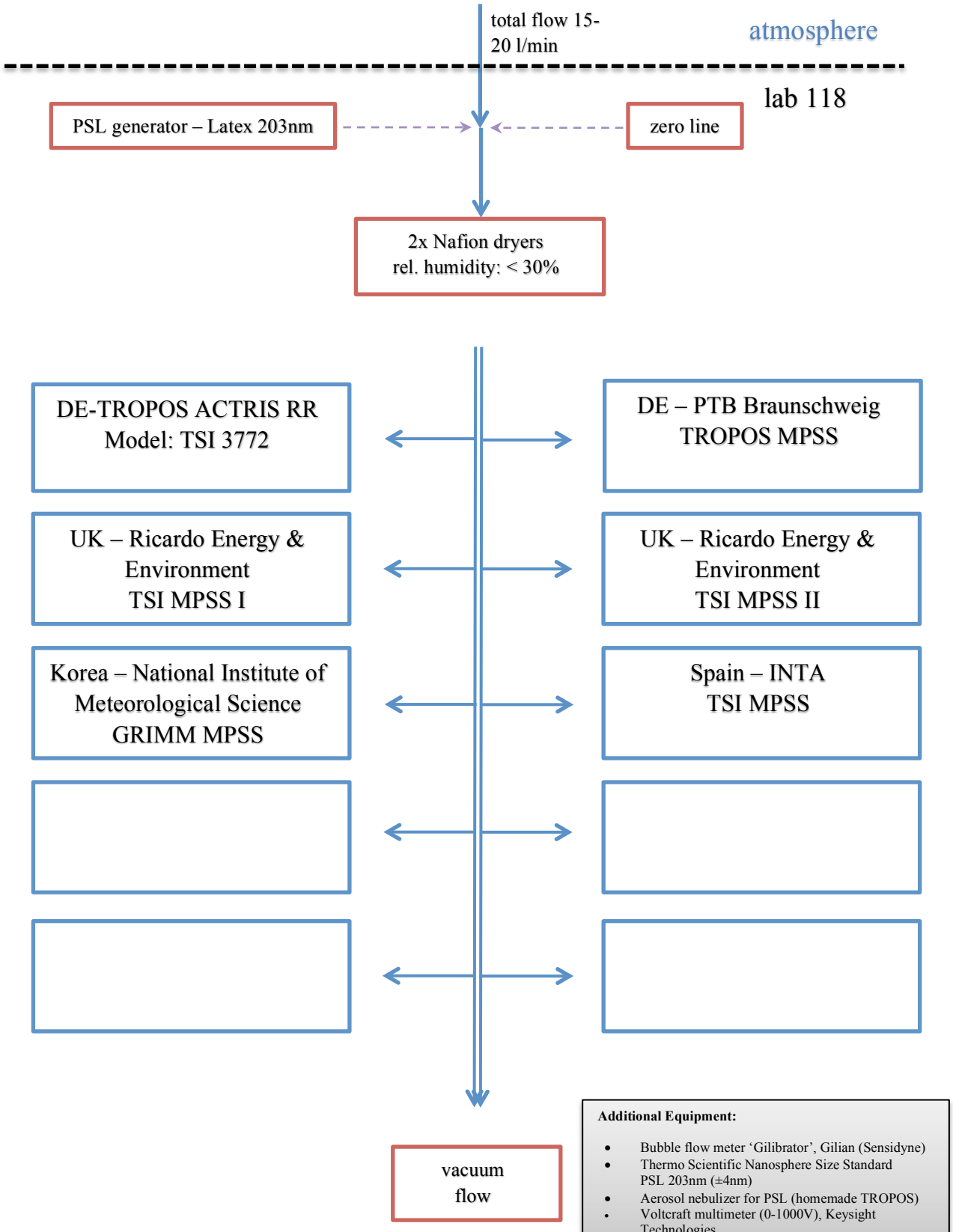
Laboratory setup:



Additional Equipment:

- Bubble flow meter 'Gilibrator', Gilian (Sensidyne)
- Thermo Scientific Nanosphere Size Standard PSL 203nm (±4nm)
- Aerosol nebulizer for PSL (homemade TROPOS)
- Voltcraft multimeter (0-1000V), Keysight Technologies

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Status of the instruments:

Date of system checks:

date	18.09.2018		unit
total CPC flow	-		l/min
aerosol flow (DMA)	-		l/min
aerosol flow (UDMA)	-		l/min
aerosol flow (total)	1.006		l/min
Zero MPSS	0		#/cm³
Zero total CPC	-		#/cm³
PSL 203 nm	203.37		nm

Special Information regarding the Candidate:

Was it necessary to:	yes/no (date)	old part (ID/SN)	new part (ID/SN)	information
clean the aerosol inlet	no	-	-	-
change aerosol Nafion dryer	no	-	-	-
change sheath Nafion dryer	no	-	-	-
check source	no	-	-	-
change HV power supply	no	-	-	-
clean/change DMA	no	-	-	-
change aerosol RH/T-sensor	no	-	-	-
change sheath RH/T-sensor	no	-	-	-
change pressure sensor	no	-	-	-
change inlet Nafion	no	-	-	-

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dryer (500)				
Change Total filter	-	-	-	-
NI-card	No			-

PSL Scan and calibration: Latex 203 nm +/- 4 nm

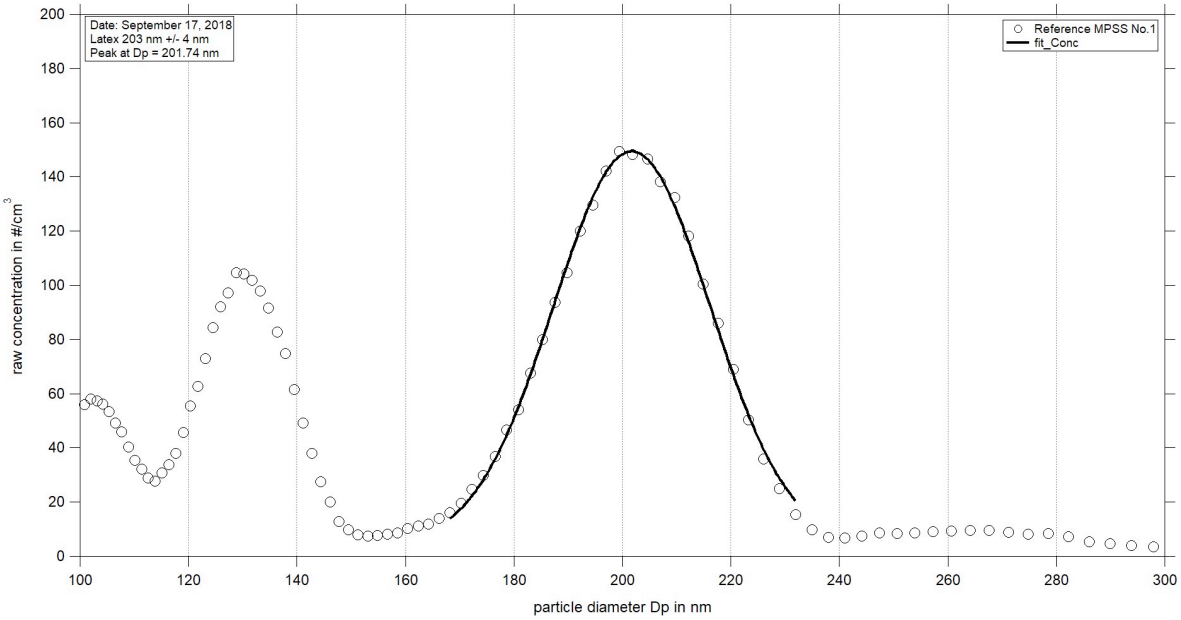

Figure 01: Measurement of latex 203 nm - Reference MPSS No.1: Particle size distribution (raw concentration) for latex 203 nm on September 17th 2018.

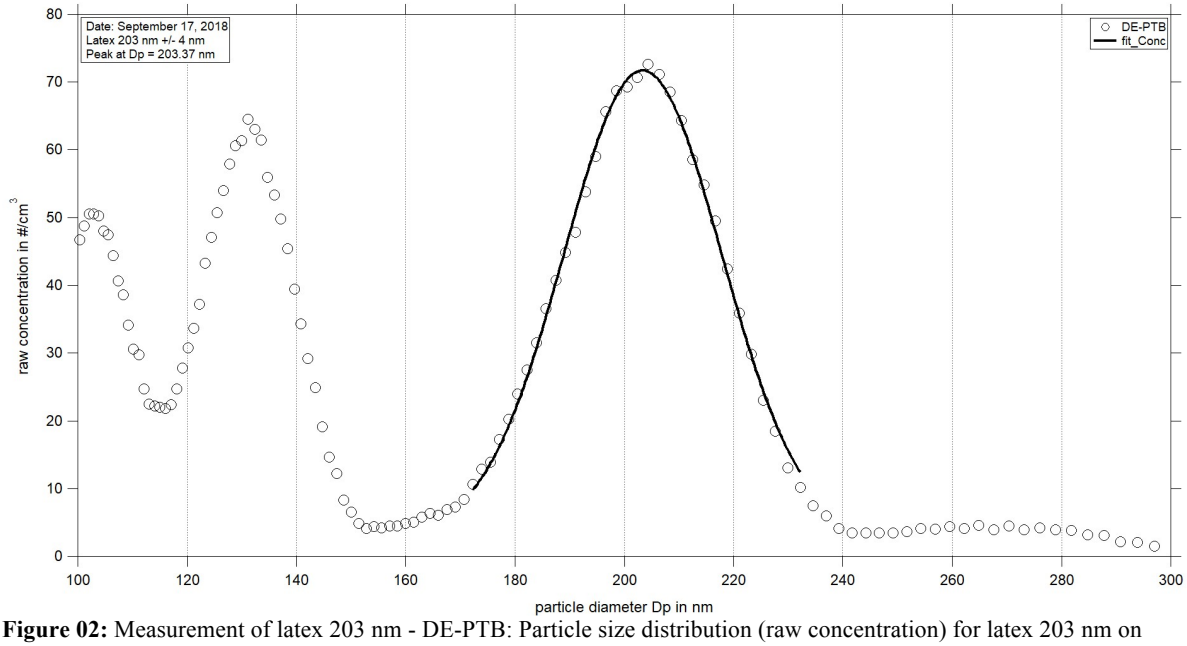

Figure 02: Measurement of latex 203 nm - DE-PTB: Particle size distribution (raw concentration) for latex 203 nm on September 17th 2018.

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Time Series, Particle Number Size Distribution and Correlation

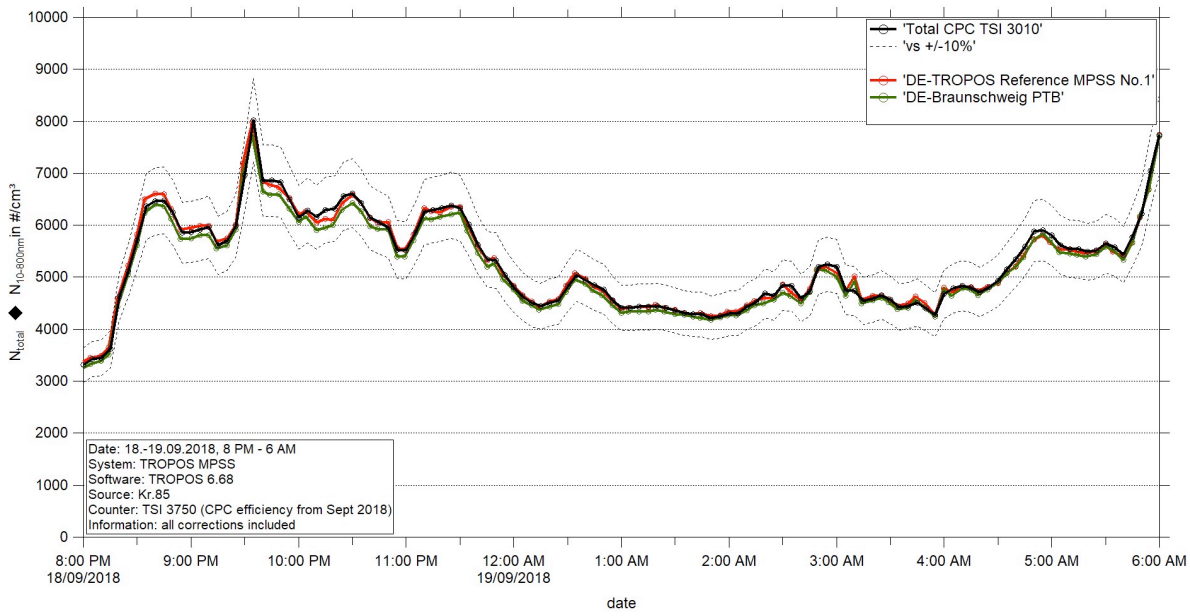

Figure 03: Time series (September 18, 2018 8 PM – September 19, 2018 6 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

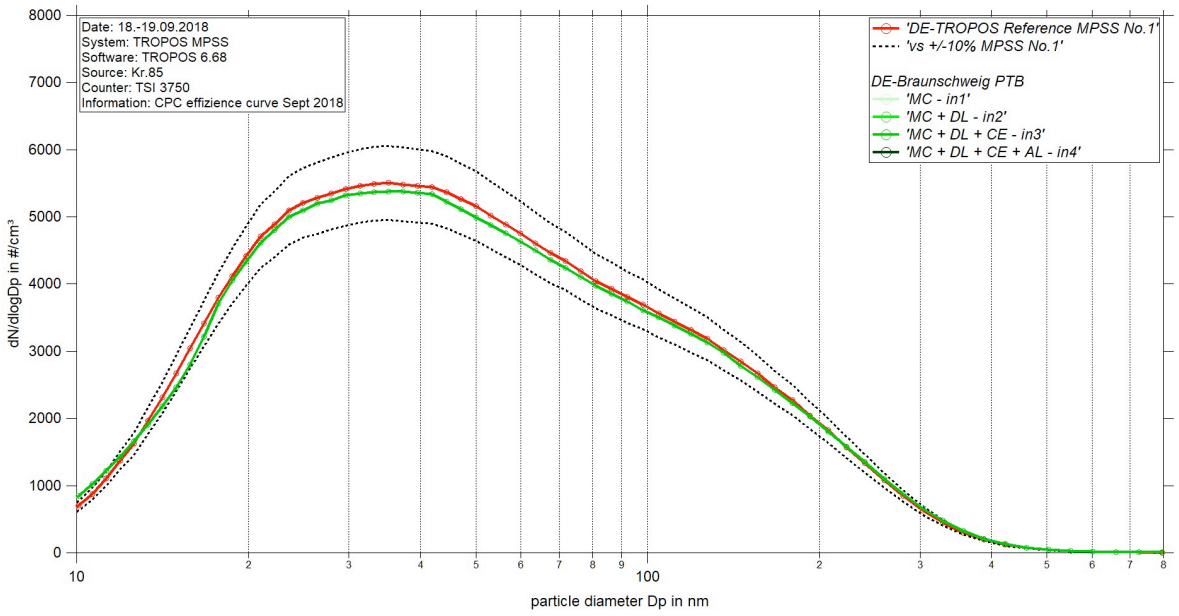

Figure 04: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.1 against DE-PTB from September 18, 2018 8 PM – September 19, 2018 6 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

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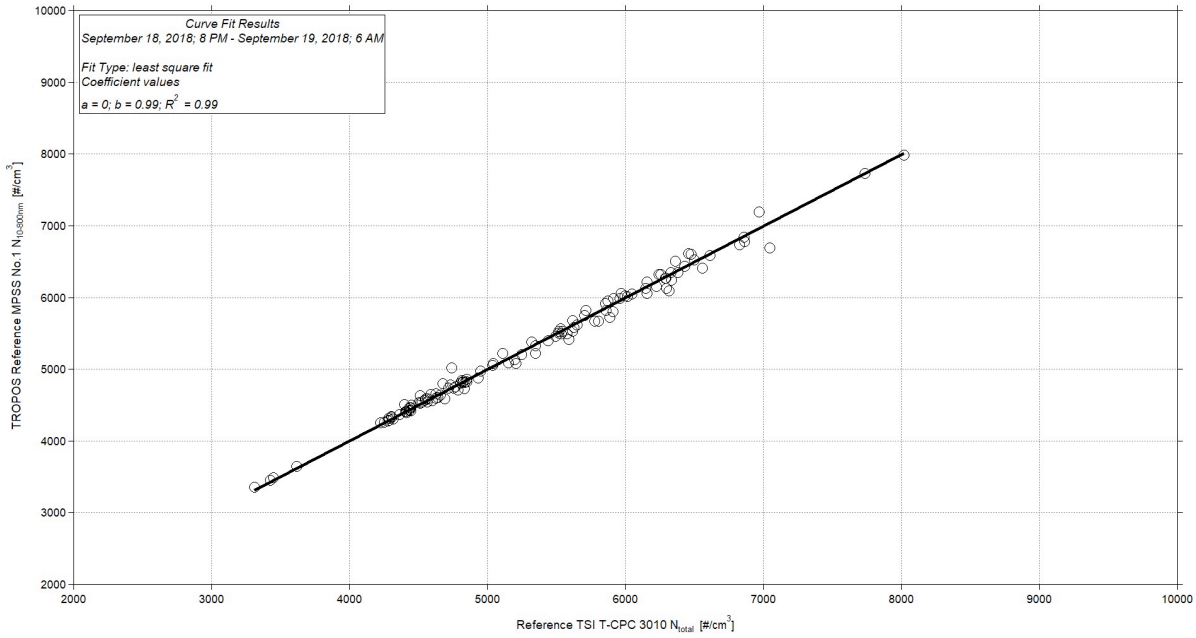

Figure 05: Linear regression between the number concentrations of the TROPOS Reference TSI T-CPC Model 3010 and TROPOS Reference MPSS No.1. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

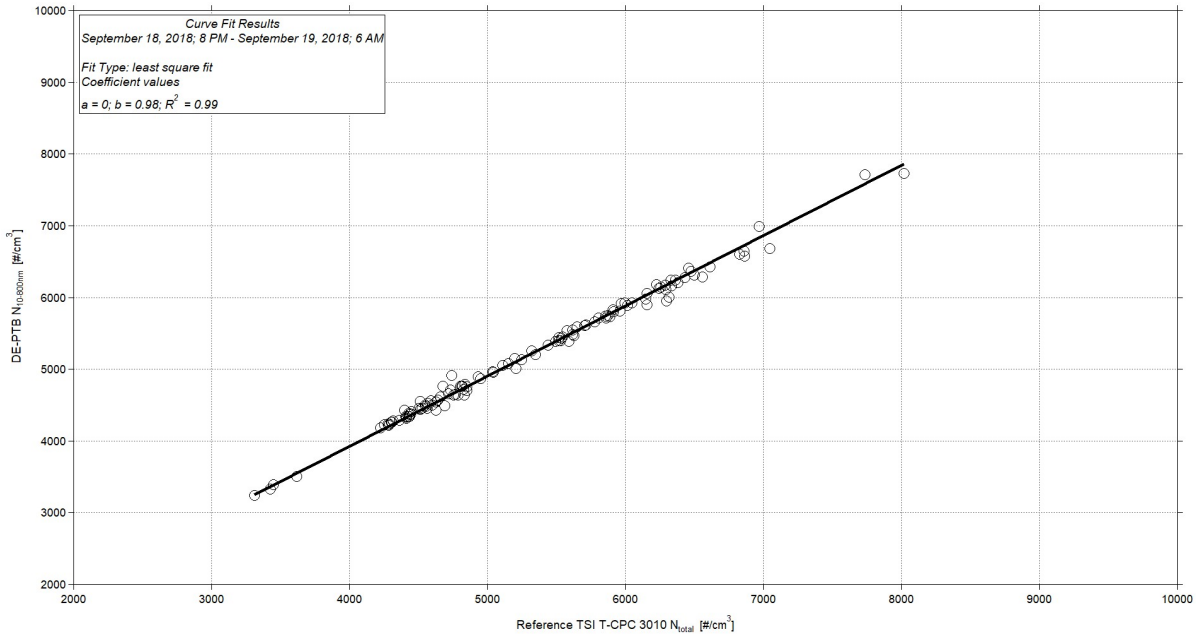

Figure 06: Linear regression between the number concentrations of the TROPOS Reference TSI T-CPC Model 3010 and DE-PTB. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

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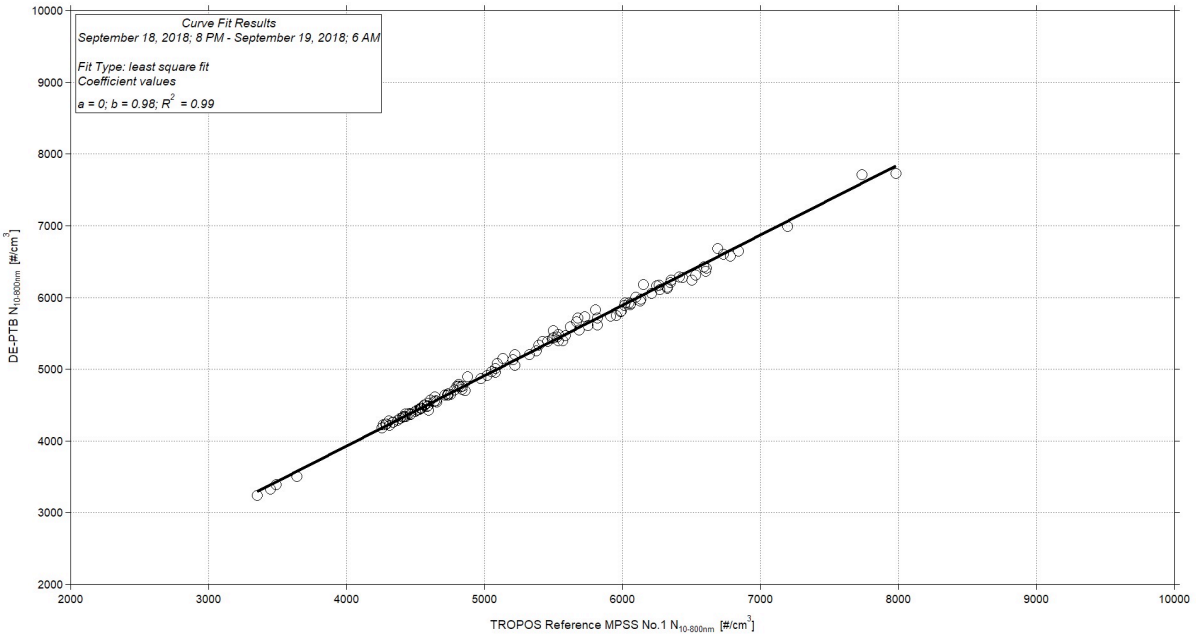

Figure 07: Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and DE-PTB. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

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